CLAIMS

What is claimed is:

1. A fuel cell comprising a cathode, an anode, an electrolyte, and an RFID transponder, wherein the transponder is configured to sense and transmit information regarding an operating parameter of the fuel cell.

2. The fuel cell of claim 1 wherein the transponder is configured to transmit its identification when the operating parameter falls below a threshold value.

3. The fuel cell of claim 1 wherein the transponder is configured to transmit its identification when the operating parameter exceeds a threshold value.

4. The fuel cell of claim 1 wherein the transponder is configured to transmit the value of the operating parameter.

5. The fuel cell of claim 1 wherein the operating parameter is cell voltage.

6. The fuel cell of claim 1 wherein the operating parameter is cell impedance.

7. The fuel cell of claim 1 wherein the transponder comprises a sensor having a cathode contact and an anode contact electrically connected to the cathode and the anode, respectively.

8. The fuel cell of claim 1 wherein the operating parameter is a half cell voltage between a reference electrode and an electrode selected from the cathode and anode.

9. The fuel cell of claim 8 wherein the transponder comprises a voltage sensor comprising the reference electrode.

10. The fuel cell of claim 1 wherein the operating parameter is cell temperature.

11. The fuel cell of claim 1 wherein the operating parameter is a reactant pressure.

12. The fuel cell of claim 11 wherein the transponder comprises a pressure sensor comprising a strain gauge bridge.

13. The fuel cell of claim 1 wherein the operating parameter is stack compression.

14. The fuel cell of claim 13 wherein the transponder comprises a load cell sensor comprising a strain gauge bridge.

15. The fuel cell of claim 1 wherein the operating parameter is a reactant flow rate.

16. The fuel cell of claim 1 wherein the operating parameter is the concentration of an impurity in a reactant.

17. The fuel cell of claim 1 wherein the transponder comprises an A/D converter to convert the sensed operating parameter into digital form for transmission.

18. The fuel cell of claim 1 wherein the fuel cell is a solid polymer electrolyte fuel cell.

19. The fuel cell of claim 1 wherein the transponder is configured to sense and transmit information regarding more than one operating parameter of the fuel cell.

20. The fuel cell of claim 1 wherein the transponder is passive.

21. A fuel cell system comprising:

a fuel cell stack comprising a plurality of the fuel cell of claim 1 electrically connected in series; and

a reader for receiving information transmitted from the transponders.

22. The fuel cell system of claim 21 wherein the operating parameter is cell voltage.

23. The fuel cell system of claim 22 wherein each of the transponders is configured to transmit its identification to the reader when the cell voltage falls below a threshold value.

24. The fuel cell system of claim 23 wherein each of the transponders is dormant when the cell voltage is above the threshold value.

25. The fuel cell system of claim 21 wherein each fuel cell further comprises an electrochemically inactive manifold section, and wherein the fuel cell stack further comprises a plurality of flow field plates arranged such that each fuel cell is interposed between two flow field plates.

26. The fuel cell system of claim 25 wherein each transponder is located in the manifold section of the fuel cell and each transponder comprises a sensor having a cathode pressure contact pad and an anode pressure contact pad, the cathode

and anode pressure contact pads being mounted on opposing faces of the manifold section and electrically contacting the two adjacent flow field plates.

27. The fuel cell system of claim 26 wherein the transponder is molded into the manifold section of the membrane electrode assembly.

28. The fuel cell system of claim 21 wherein the fuel cell stack is a solid polymer electrolyte fuel cell stack.

29. The fuel cell system of claim 21 comprising more than one reader.

30. A method of monitoring an operating parameter of a fuel cell, the method comprising:

incorporating an RFID transponder into the fuel cell, wherein the transponder is configured to sense and transmit information regarding the operating parameter;

sensing the operating parameter; and

transmitting information regarding the operating parameter to a reader.

31. The method of claim 30 comprising transmitting the identification of the transponder when the operating parameter falls below a threshold value.

32. The method of claim 30 comprising transmitting the identification of the transponder when the operating parameter exceeds a threshold value.

33. The method of claim 30 comprising transmitting the value of the operating parameter.

34. The method of claim 30 wherein the operating parameter is cell voltage.

35. The method of claim 30 wherein the operating parameter is cell impedance.

36. The method of claim 30 wherein the operating parameter is a half cell voltage between a reference electrode and a cathode or an anode of the fuel cell.

37. The method of claim 30 wherein the operating parameter is cell temperature.

38. The method of claim 30 wherein the operating parameter is a reactant pressure.

39. The method of claim 30 wherein the operating parameter is stack compression.

40. The method of claim 30 wherein the operating parameter is a reactant flow rate.

41. The method of claim 30 wherein the operating parameter is the concentration of an impurity in a reactant.

42. A method of monitoring a fuel cell stack for voltage reversal in individual fuel cells of the fuel cell stack, the method comprising:

incorporating an RFID transponder into each fuel cell in the stack, wherein each transponder is configured to sense and transmit information regarding the cell voltage;

sensing the cell voltage, and

transmitting information regarding the cell voltage to a reader.

43. The method of claim 42 wherein the method comprises transmitting the identification of the transponder in a fuel cell when the sensed cell voltage falls below a threshold value.

44. The method of claim 43 wherein the transponder in each fuel cell is dormant when the cell voltage is above the threshold value.

45. The method of claim 42 wherein the fuel cell stack is a solid polymer electrolyte fuel cell stack.